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FLOOD INSURANCE STUDY

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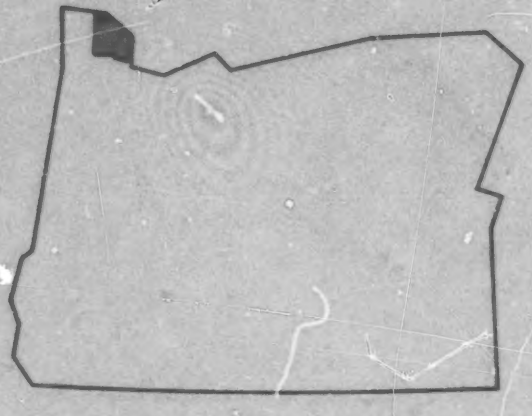
CITY OF CLATSKANIE, OREGON
COLUMBIA COUNTY



SEPTEMBER 29, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 410035

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PUBLISHED SEPARATELY:

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Clatskanie, Columbia County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Portland District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-E-1153, Project Order No. 1, Amendment No. 3. This study was completed in November 1984.

1.3 Coordination

On February 22, 1983, a precontract coordination meeting that included representatives of the U.S. Army Corps of Engineers and FEMA, and officials of the City of Clatskanie was held at Clatskanie city hall. As a result of the meeting: (1) the city was informed of its status in the NFIP; (2) all pertinent data on flooding available in the community were gathered; and (3) an agreement on areas to be studied was reached.

Coordination with the city officials continued throughout the study.

The final community coordination meeting was held on December 17, 1985, and attended by representatives of FEMA, the study contractor, and the community. All problems raised at that meeting have been addressed in this study.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Clatskanie, Columbia County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

Clatskanie River from River Mile (R.M.) 0.8 (Burlington Northern Railroad Bridge) to 2.8 (downstream of Hazel Grove Road) and Conyers Creek from R.M. 0.0 to 0.3 were studied by detailed methods. The unincorporated area surrounding the City of Clatskanie is included in the Columbia County Flood Insurance Study (Reference 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through 1989.

2.2 Community Description

The City of Clatskanie is located near the confluence of the Clatskanie and Columbia Rivers in the northern part of Columbia County, Oregon. The city is 35 miles east of Astoria, 13 miles west of Longview, Washington, and 60 miles northwest of Portland in the northwestern part of the State.

The area of Clatskanie was settled by E.G. Bryant, Enoch Conyers, and others in 1852 and was first called Bryantville. Clatskanie was shown on the official post office list as early as 1871; Enoch Conyers was the first postmaster. The city was incorporated in 1893. The name is of Indian origin and refers to a route that the Tlatskansi Indians took to a meeting place. Early development centered on logging and river commerce. Benson rafts, constructed by tying logs into large cigar-shaped rafts up to 1,000 feet long and used for transport to California, were developed here.

The economic character of Clatskanie has not changed substantially since the 1950s. It remains a community dependent on the wood products industry. However, most employment is found in communities or industries located outside the city limits. Thus, Clatskanie can be described as a bedroom community for the immediate employment area. The wood products industry around Clatskanie tends to be specialized and to have a consistent market. The sole industrial concern within the city limits of Clatskanie is the Boise Cascade Corporation. The diked lands north of Clatskanie form the principal agricultural lands near the town. Cattle, dairy products, mink, wheat, and hay are marketed (Reference 2).

The population of Clatskanie expanded dramatically between 1960 and 1970, from 797 to 1,286 residents. In 1980, the population was 1,648; in 1982, 1,675 (Reference 3). Population projections

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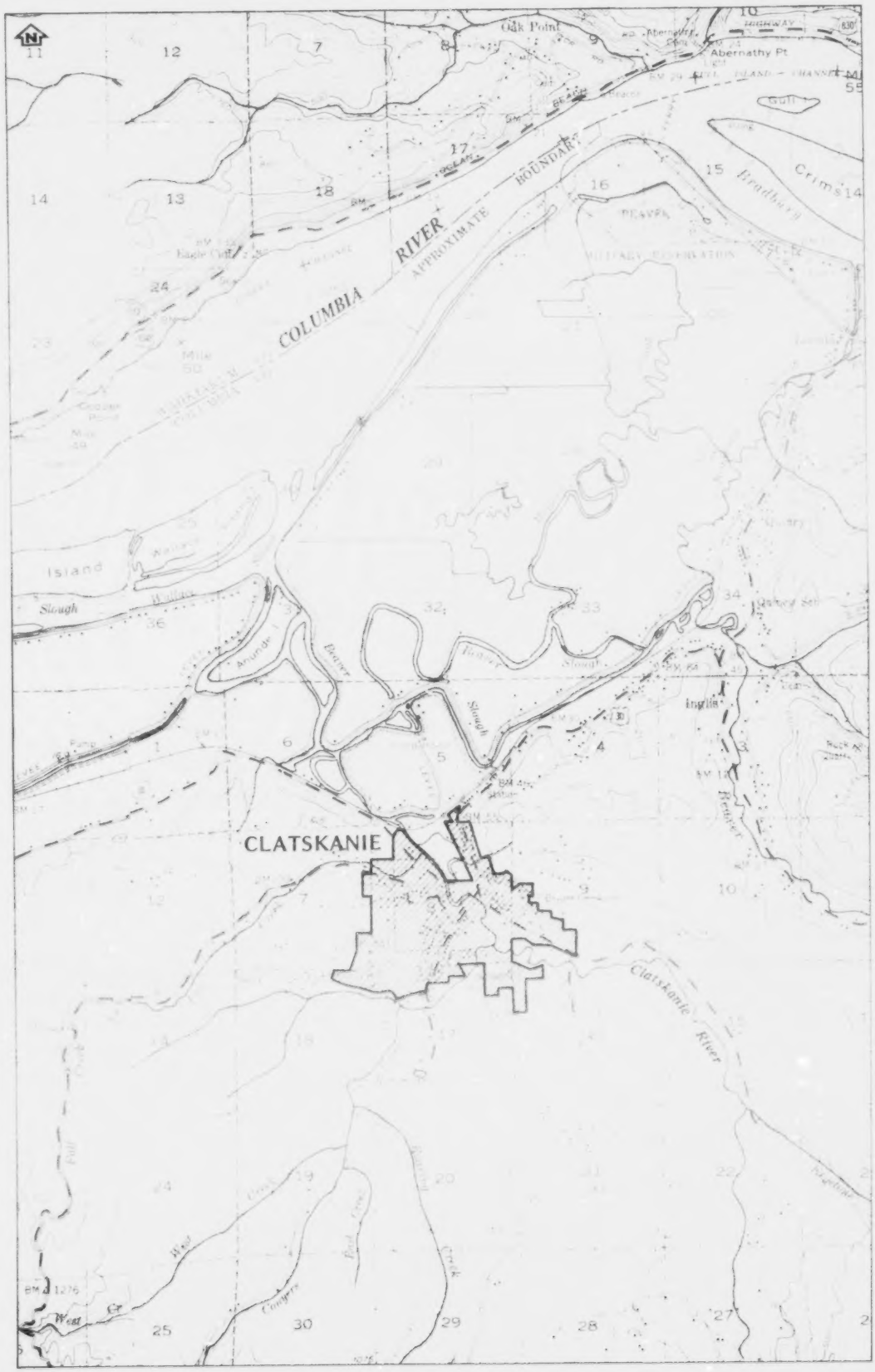

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CLATSKANIE, OR
(COLUMBIA CO.)

VICINITY MAP

FIGURE 1

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for the year 2000 vary from 3,156 to 4,636. According to the Comprehensive Plan for Clatskanie, this growth can be accommodated within the urban growth boundary without adversely affecting the open nature of the city. Approximately 20 percent of the land within the city limits is on slopes of 20 percent or greater. The soils consist mainly of silt loams of the Aloha-Quatana series. These silt loams are deep, somewhat poorly drained, medium acid, water-deposited soils with dark grayish-brown, friable surface layers and brown, firm, somewhat brittle subsurface layers. Development of these lands would be difficult. Because of its location in a valley floor surrounded by six hills with elevations up to 800 feet, Clatskanie is expected to retain a natural character well into the next century.

The natural character of the city is complemented by the frequent sightings of deer and Roosevelt elk within the city limits. Other wildlife are also abundant in the area.

The climate of Clatskanie is characterized by mild, wet winters and dry, pleasant summers. Average annual precipitation is 58.3 inches. Approximately 80 percent of the precipitation occurs from October through March. Mean daily temperature is 38°F in January and is 62°F in July. The extremes are 4°F and 61°F in January and 37°F and 103°F in July (Reference 4). Because the climate of Clatskanie is moderated by westerly breezes from the Pacific Ocean, climatic extremes are rare. Clatskanie River drains an area of 94 square miles.

2.3 Principal Flood Problems

Flooding from Clatskanie River and Conyers Creek is generally caused by rainfall in the winter, the period of greatest storm activity. Floods rise quickly after a heavy rainstorm and usually last 1 day on Clatskanie River and less than one-half day on Conyers Creek. The occasional combination of rainfall and snowmelt would accentuate the flooding problem along Clatskanie River and Conyers Creek.

The largest floods on Clatskanie River during the last 30 years occurred in 1956, 1964, 1972, and 1974. These floods, however, caused only minimal property damage and some inconvenience from overtopped roads and bridges. The only damaging flood occurred in 1948, when Columbia River backwater on Clatskanie River overtopped three downstream drainage districts and flooded part of the central Clatskanie business district near the Nehalem Street Bridge at R.M. 1.6. Completion of upstream Columbia River reservoirs during the past 35 years has greatly reduced the flooding potential in Clatskanie from this source. However, flood elevations on the lower portions of Clatskanie River are still controlled by backwater from Columbia River floods. Flooding on Conyers Creek is not well documented and is considered a minimal problem because the flood plain is used mainly for agriculture. Flood elevations on the

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lower portion of Conyers Creek are controlled by backwater from Clatskanie River floods. Figure 2 shows 1956 flooding in Clatskanie from Clatskanie River. Figure 3 shows the heights that would be expected from 100- and 500-year floods on Conyers Creek.

2.4 Flood Protection Measures

The only existing flood protection measure for Clatskanie is a levee system located on the right bank of Clatskanie River. The system is owned jointly by the city and private interests. Some commercial and agricultural development and a lumber stockyard are protected by the levee system. It is a 0.8-mile-long levee system tied into the Burlington Northern Railroad Bridge at R.M. 0.8, and extends upstream to the Nehalem Street Bridge at R.M. 1.6. Results of the hydraulic study indicate that a 100-year floodflow on Clatskanie River would overtop its right bank near R.M. 1.6 and inundate the right overbank area that is protected by the levee system.

The Columbia River flood-control system consists of a series of flood-control storage reservoirs in both the United States and Canada. There are 22 major reservoirs in the Columbia River basin upstream of Willamette River, with a total flood-control storage volume of approximately 40 million acre-feet (Reference 5).

In addition, there are 11 major flood-control reservoirs in the Willamette River basin, with approximately 1.7 million acre-feet of flood storage (Reference 6). Mossy Rock Reservoir on Cowlitz River also contributes 360,000 acre-feet of flood-control storage upstream of Clatskanie River (Reference 7). The combined total of upstream flood-control storage available is approximately 42.1 million acre-feet.

There are no other flood-control structures on Clatskanie River or on Conyers Creek.

Nonstructural measures (flood hazard zoning ordinance and building permits) are also being used to aid in the prevention of future flood damage. The zoning ordinance (enacted March 3, 1969, and amended July 9, 1980) follows the FEMA guidelines for controlling development within the 100-year flood plain. The city requires building permits, and it reviews those permits to see if the provisions of the flood hazard zoning ordinance have been complied with to assure that sites are reasonably safe from flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any

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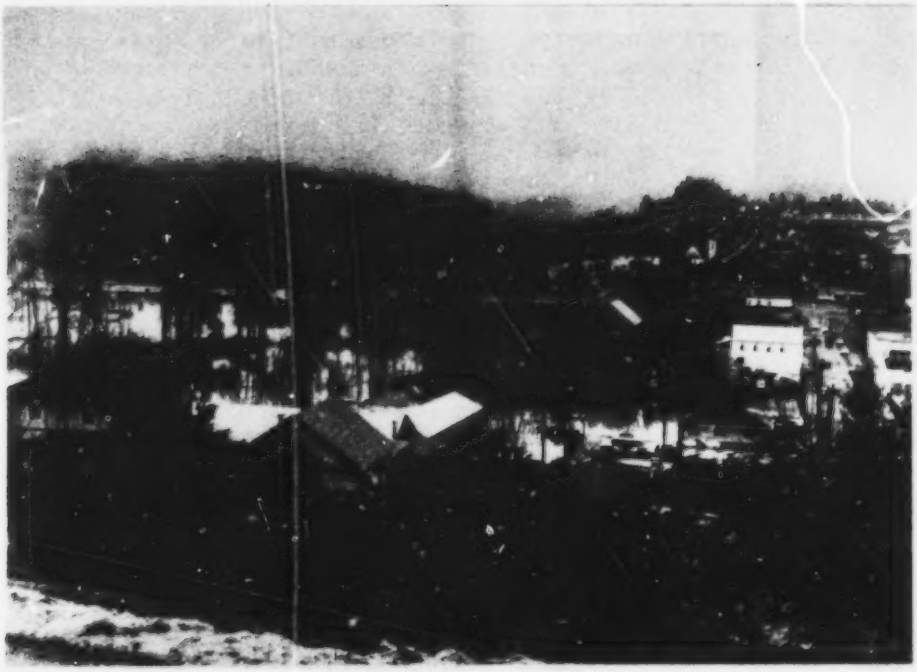

Figure 2. Clatskanie River, 1956 Flood, Looking Southwest With Nehalem Street Bridge at Right and U.S. Highway 30 Bridge in Left Background

Figure 3. Estimated Flood Elevations From Conyers Creek at Center of Belleflower Road, RM 0.1

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10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

There are no stream gaging stations on Clatskanie River or Conyers Creek. The frequency discharges were developed by the regional analysis presented in Magnitude and Frequency of Floods in Western Oregon, U.S. Geological Survey Open-File Report 79-553, dated 1979 (Reference 8). The frequency discharges developed by this procedure were checked by a Myers enveloping curve prepared for northwest Oregon for the 100-year event.

Peak discharge-drainage area relationships for Clatskanie River and Conyers Creek are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Hydraulic analyses were performed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (Reference 9). Cross sections for Clatskanie River and Conyers Creek came from a composite of channel data obtained from U.S. Army Corps of Engineers field surveys and overbank data taken from topographic maps (References 10 and 11). All bridges and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross

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Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Clatskanie River					
At Upstream Limit of Study	76.8	4,650	7,000	8,100	10,800
Above Confluence With Conyers Creek	77.4	4,670	7,040	8,150	11,000
Below Confluence With Conyers Creek	89.3	5,300	7,980	9,240	12,400
Above Confluence With Fall Creek	90.2	5,350	8,060	9,330	12,500
Below Confluence With Fall Creek	93.5	5,520	8,320	9,630	12,800
Near Downstream Limit of Study	94.3	5,560	8,380	9,700	13,000
Conyers Creek					
At Upstream Limit of Study	8.7	690	1,030	1,200	1,590
Above Confluence With Unnamed Tributary	9.8	760	1,140	1,320	1,800
Below Confluence With Unnamed Tributary	11.2	860	1,290	1,490	1,980
At Downstream Limit of Study	11.9	900	1,360	1,570	2,100

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section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness values (Manning's "n") for the channel and overbanks were first estimated from field observation. The "n" values for Clatskanie River and Conyers Creek were then verified using high-water marks from previous floods. The final calibrated "n" values for Clatskanie River were 0.035 for the channel and from 0.040 to 0.100 for the overbanks. The final calibrated "n" values for Conyers Creek were 0.070 for the channel and from 0.100 to 0.141 for the overbanks.

Starting water-surface elevations for Clatskanie River and Conyers Creek were based on normal-depth calculations.

Columbia River backwater controls the flood elevations of the Clatskanie River from their confluence upstream to Nehalem Road. A U.S. Army Corps of Engineers report was used to determine the water-surface elevations for the 10-, 50-, 100-, and 500-year discharges of Columbia River (Reference 12).

Clatskanie River backwater controls the flood elevations of Conyers Creek from their confluence upstream 0.4 mile. The HEC-2 step-backwater analysis was used to determine the water-surface elevations for the 10-, 50-, 100-, and 500-year discharges of Clatskanie River.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries

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have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at scales of 1:2,400 and 1:4,800, with contour intervals of 4 feet (Reference 10 and 11, respectively).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

No floodway determination was required for Conyers Creek in this study.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Clatskanie River								
A	0.78	218/130	2,008	4.8	12.3	9.4[3]	9.6[3]	0.2
B	1.05	148/110	1,628	5.7	12.3	10.4[3]	10.6[3]	0.2
C	1.30	135/70	1,694	5.5	12.3	11.4[3]	11.5[3]	0.1
D	1.57	112	1,385	6.7	12.4	12.4	12.5	0.1
E	1.79	400	2,665	3.5	14.3	14.3	14.4	0.1
F	1.94	275	2,155	4.3	14.6	14.6	15.0	0.4
G	2.03	135	1,698	5.4	14.8	14.8	15.3	0.5
H	2.14	195	1,872	4.4	16.3	16.3	16.5	0.2
I	2.32	345	2,982	2.7	16.4	16.4	17.1	0.7
J	2.72	690/40	4,912	1.7	17.0	17.0	17.8	0.8

[1]RMs Above Confluence With Beaver Slough [2]Total Width/Width Within Community, If Less

[3]Elevation Computed Without Consideration of Maximum Backwater From Columbia River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CLATSKANIE, OR
(COLUMBIA CO.)

FLOODWAY DATA

CLATSKANIE RIVER

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without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 4.

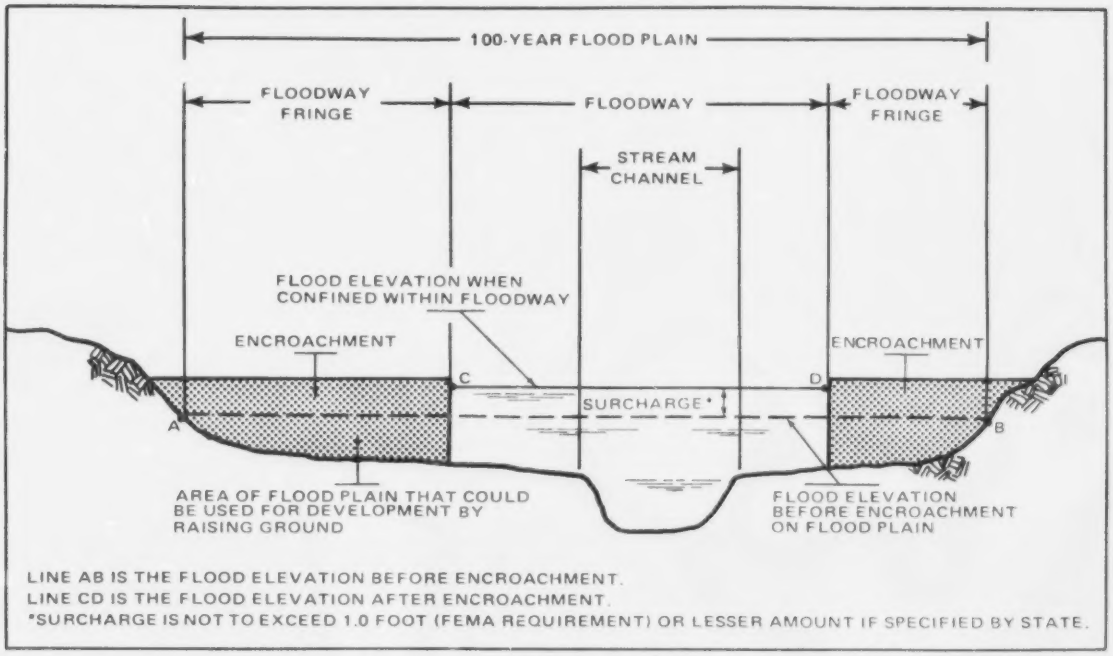
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 4. Floodway Schematic

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Clatskanie.

5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

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The locations of the reaches determined for the flooding sources of the City of Clatskanie are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zones A2, A4, and A8:	Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other local water-control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flood hazard; not subdivided.

The flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 3.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Clatskanie River							
Backwater from Columbia River	0001	-2.0	-1.2	1.8	020	A4	12
Reach 1	0001	-3.8	-1.1	1.7	040	A8	Varies - See Map
Conyers Creek							
Backwater from Clatskanie River	0001	-3.8	-1.1	1.7	040	A8	16
Reach 1	0001	-1.0	-0.3	0.5	010	A2	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CLATSKANIE, OR
(COLUMBIA CO.)

FLOOD INSURANCE ZONE DATA

CLATSKANIE RIVER (BACKWATER FROM COLUMBIA RIVER)-
CONYERS CREEK (BACKWATER FROM CLATSKANIE RIVER)

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5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Clatskanie is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the NFIP.

6.0 OTHER STUDIES

The U.S. Army Corps of Engineers is preparing a Flood Insurance Study for the unincorporated areas of Columbia County (Reference 1), including the area surrounding Clatskanie. The results of this study and of the Columbia County Flood Insurance Study are in agreement.

A Flood Hazard Boundary Map has been prepared for the City of Clatskanie, Oregon (Reference 13). However, this study represents a more detailed analysis. No other studies concerning flood hazards in Clatskanie were found at the time of this report.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98021-9796.

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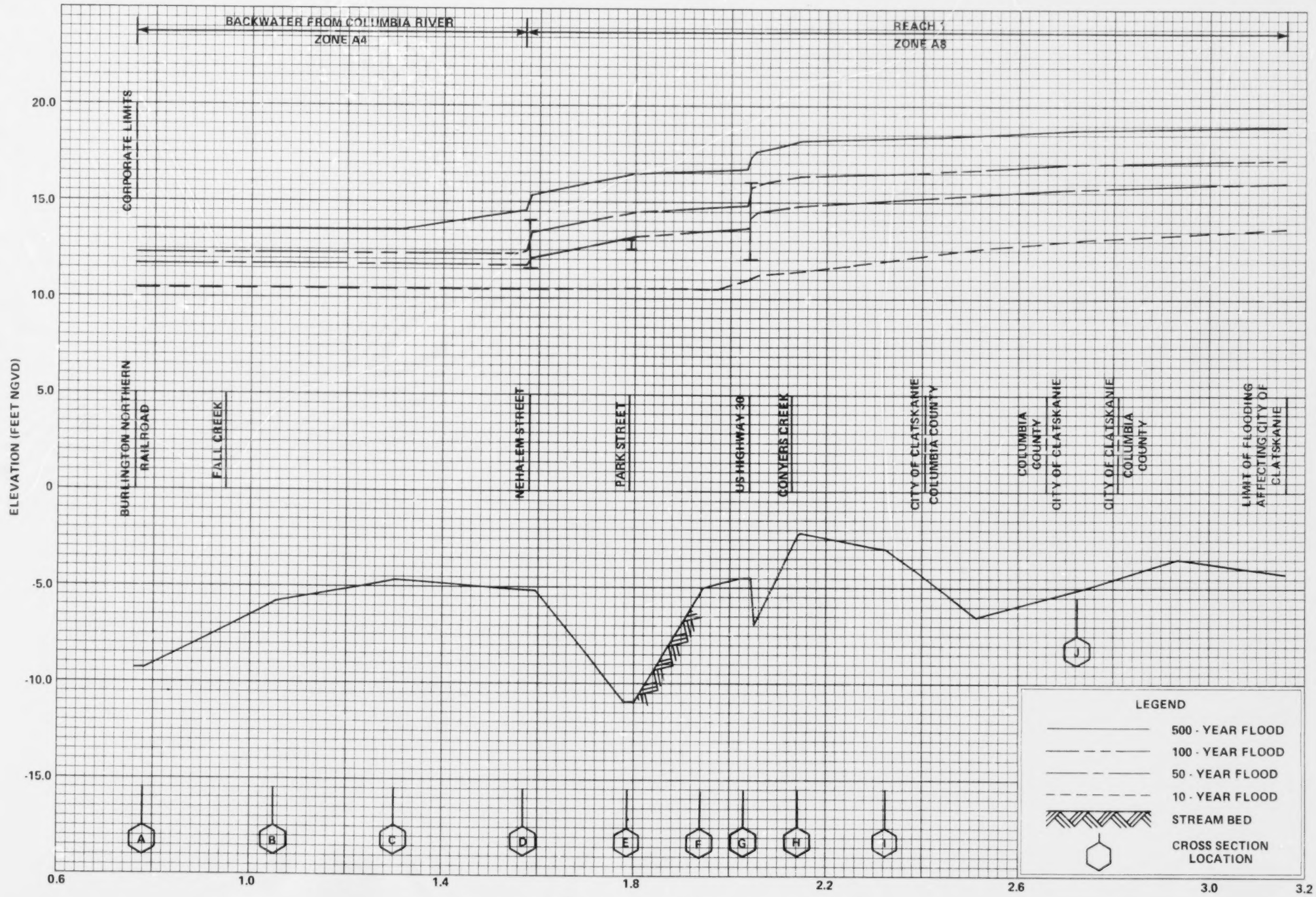

FLOOD PROFILES

CLATSKANIE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CLATSKANIE, OR
(COLUMBIA CO.)

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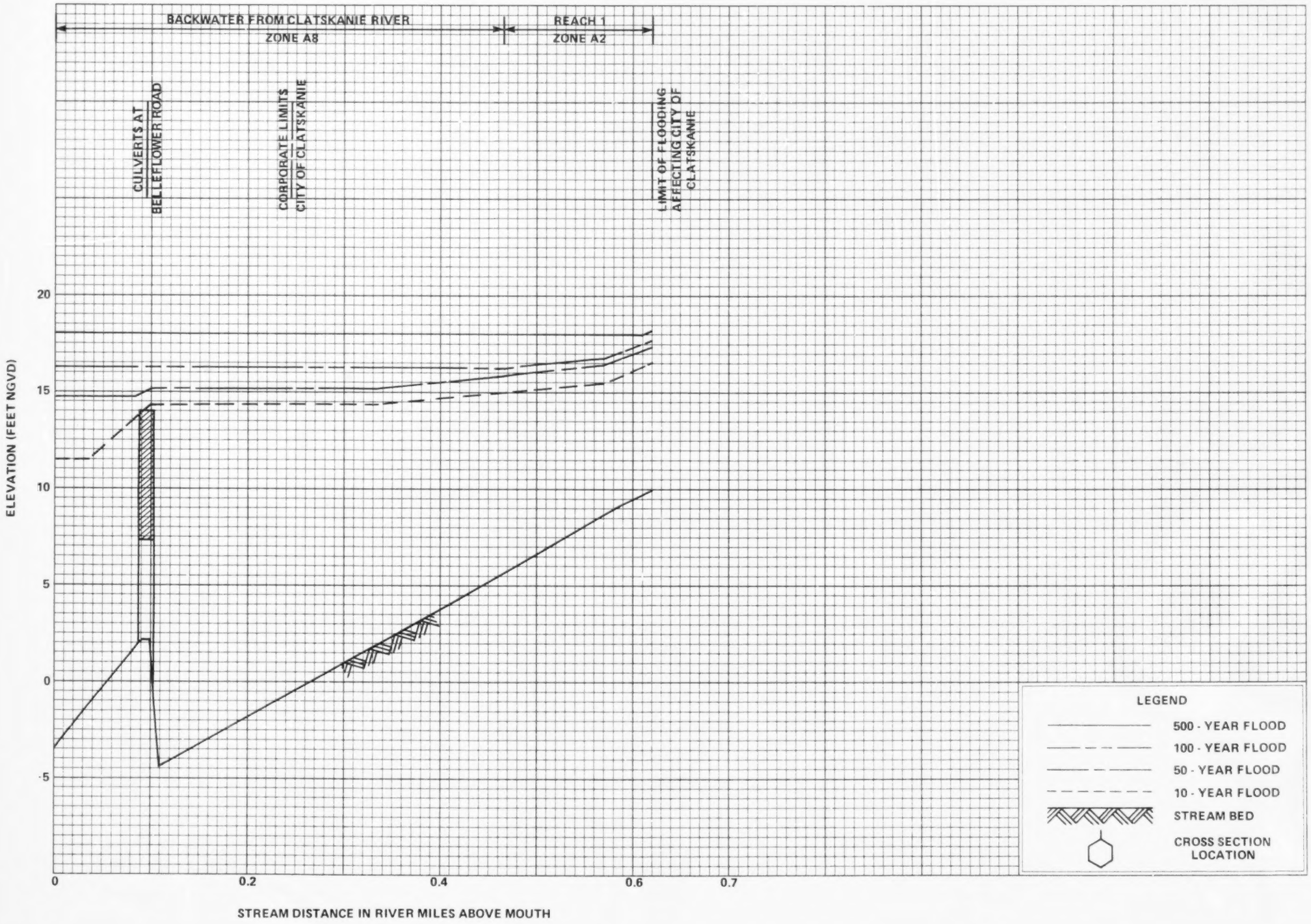

FLOOD PROFILES

CONYERS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CLATSKANIE, OR
(COLUMBIA CO.)

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